

PULP & PAPER

December 1985

C3975-2



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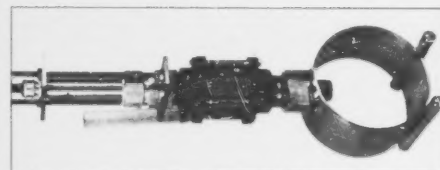
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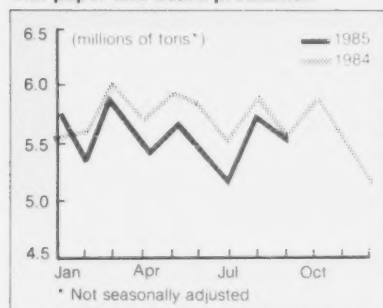


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U.S. paper and board production



U.S. paper and paperboard

production in the third quarter recovered somewhat from the slow second period, but the seasonally adjusted rate of 67.2 million tpy still lagged the first-quarter rate of 67.2 million tpy, the American Paper Institute said. Moreover, weekly data show a fourth-quarter dip that, if sustained, would lead to a grand total of about 66.6 million tons for 1985—compared with 68.5 million tons in 1984.

Among major grades, printing and writing paper production was virtually even with last year, thanks to a 4.3% increase in uncoated free-sheet shipments. Newsprint and tissue also hovered close to year-ago levels, but packaging and industrial papers dropped a sharp 8.0%. Production of unbleached kraft board was off 5.8% from last year, with production for export down a dismal 23.5%, although containerboard inventories at mills and box plants are continuing to decline.

Canadian newsprint shipments

dipped slightly below last September's level, while inventories held by U.S. consumers rose 3.1% and operating rates stood firm at 92%. Canadian market pulp shipments stood 4.6% above last year, but September operating rates dipped to 75%.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
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PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Sept.	447	.0	5,471	-1.8
Uncoated groundwood (s)	Sept.	123	-7.5	1,469	-7.6
Coated paper (s)	Sept.	437	-14.8	5,949	-4.2
Uncoated free sheet (s)	Sept.	793	7.0	9,645	4.3
Other printing/writing	Sept.	114	-8.1	1,341	-8.7
Total packaging and other paper (s)	Sept.	468	1.3	5,240	-8.0
Tissue	Sept.	392	1.6	4,902	.8
Total paper	Sept.	2,774	-1.1	34,016	-1.6
Unbleached kraft paperboard	Sept.	1,407	-4.3	16,480	-5.8
Semichemical medium	Sept.	422	-3.2	5,062	-3.2
Bleached paperboard	Sept.	309	-5.8	3,975	-3.0
Recycled paperboard	Sept.	634	2.1	7,668	-1.2
Total paperboard	Sept.	2,772	-2.9	33,184	-4.0

Total U.S. paper and paperboard output

Sept.	5,545	-2.0	67,201	-2.8
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PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Aug.	4,518	-5.7	54,284	-3.1
Market pulp production	Aug.	541	-8.8	6,872	-1.1
Wastepaper consumption at paper/board mills	Aug.	1,294	-4.1	15,197	-4.4
Pulpwood consumption (cords)	Aug.	6,925	-6.0	85,733	-2.7

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ³)	Sept.	22,037	1.2	200,642 ⁴	-5
Containerboard inventories at U.S. box plants and mills	Sept. 1	2,694	-4.5		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Aug.	873	-7.1	10,999	3.8
Imports of Canadian newsprint	Aug.	639	-8.2	8,067 ⁴	4.9
U.S. paper exports (including products)	Aug.	356	1.7	4,001	-10.0
Exports of unbleached kraft linerboard	Sept.	145	-18.1	1,729	-23.5
Exports of woodpulp	Aug.	303	-4.7	3,852	5.2
Norscan pulp inventories ⁵	Sept. 30	1,397	-10.0		
Norscan pulp operating rates ⁶	Sept.	80%	87%	87%	86%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Sept.	696	-6.3	6,652 ⁴	-7
Operating rates	Sept.	92%	92%	92%	91%
Inventories held by U.S. consumers	Sept. 30	1,526	3.1		
Other paper/board shipments	Sept.	245	18.4	2,237	9.5
Woodpulp shipments (export only)	Sept.	571	-4.7	5,192 ⁴	4.6
Operating rates	Sept.	75%	83%	87%	85%

1. American Paper Institute. 2. APT, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = shipments.

NEWSPRINT: Little growth in U.S. markets seen for 1986, prices will remain weak

Grade structure: About three-quarters of all newsprint consumed in the U.S. is used by daily newspapers, with the balance going largely to government printers, weekly newspapers, and commercial printers for end uses such as newspaper inserts, flyers, and comic books. Standard newsprint basis weight is 30 lb/3,000 ft², with a range from 28 lb to 32 lb being most common in the U.S. There has been some shift to the lightweight end of the range in New England and in one or two southern mills. Brightness of newsprint is typically in the 55 to 61 range compared with the 60 to 70 brightness range for uncoated groundwood grades.

Production/capacity: North American mills produced very close to record amounts in 1985, but an influx of low-priced imports from overseas absorbed any growth in the market. Output is expected to show little improvement in 1986, while operating rates will also be largely unchanged due to the absence of any significant new capacity.

Canadian mills supplied 57% of U.S. consumption through the first three quarters of 1985, up from the 56% they supplied in the same period of 1984 when a two-month shutdown in British Columbia reduced Canada's market share. Market share in the U.S. of overseas mills rose to 2.6% from 1.7%. Canada's shipments to its own market fell 2.4% through September, and its sales overseas dropped by 5.4%.

Outlook: With the U.S. gross national product expected to rise by about 2.75% in 1986, and newsprint demand being held back by a likely consumer inventory reduction and continued caution on the part of advertisers, the

U.S. market should be in for a repeat of 1985.

Consumption is projected to rise by 1.5%, and offshore imports will retain their market share, although their growth has probably peaked out. Indeed, there are signs that importers to the eastern region are beginning to shift their marketing from spot market deals to long-term contracts.

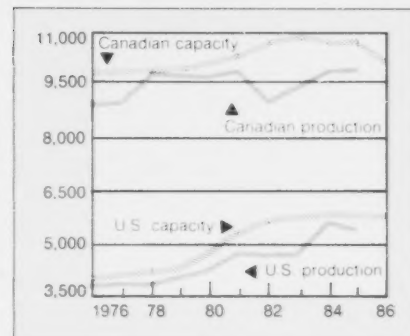
But the combination of slow demand growth and continued import penetration means occasional downtime for domestic mills and trouble in getting through a price increase before October—if then.

Pricing: One producer announced a \$32/short ton price increase (to \$517) for Jan. 1, 1985, which was rolled back to Apr. 1 due to lack of industry support. Including Jan. 1, various mills tried to raise prices seven times in 1985—all unsuccessfully. It was thought possible that another attempt might be made for Apr. 1, 1986, which would have to be announced by Jan. 1, 1986. In the meantime, discounting was so widespread that the average market price was believed to be no higher than \$445/short ton going into the fourth quarter. West Coast firms formalized this price weakness by offering contract customers who take 10,000 tpy a 5% discount on top of previous discounts, bringing their price to \$438.

List price history is as follows: (U.S. East, contract, year-end) 1974, \$235; 1975, \$258; 1976, \$285; 1977, \$300; 1978, \$320; 1979, \$375; 1980, \$400/\$426; 1981, \$454; 1982, \$425; 1983, \$454; 1984, \$485; 1985, \$485.

Markets: Canada's market share in the U.S. was 56.9% in 1984, down slightly from the 57.4% of 1983. Canada has supplied about 57% of U.S. demand for several years.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1984	1985e	1986e
United States			
Production ¹	5,539	5,419	5,504
Capacity ¹	5,847	5,758	5,765
Utilization rate	94.7%	94.1%	95.5%
Apparent U.S. consumption	12,611	12,733	12,924
lb/capita	107.1	107.1	107.7
GNP ratio	7.70	7.55	7.46
Canada			
Production ²	9,937	9,965	10,072
Capacity ²	10,825	10,825	10,979
Utilization rate	91.8%	92.0%	91.7%

1. American Paper Institute data.

2. Canadian Pulp & Paper Assn. data.

e = Pulp & Paper estimate.

TOP PRODUCERS (000 tpy)

	Annual capacity			Market share (%)
	U.S.	Canada	Total	
1. Abitibi-Price	334	1,755	2,089	12.6
2. Bowater ¹	975	225	1,200	7.2
3. CIP Inc.	—	1,189	1,189	7.2
4. MacBilo	—	872	872	5.3
5. Champion ²	802	—	802	4.8
6. Kruger ³	—	802	802	4.8
7. Boise ⁴	524	273	797	4.8
8. Ontario Paper	—	768	768	4.6
9. Con-Bath	—	724	724	4.4
10. K-C ⁵	328	364	692	4.2

Market share of top five companies:
37.0%

Market share of top ten companies:
59.9%

Total North American capacity (1985):
16,583 million tons

1. Includes Catawba Newsprint (51% owned), Calhoun, Tenn., and Bowater Merséy (51% owned).

2. Consists of newsprint mills of the former St. Regis Paper Co.

3. Includes the Corner Brook, Nfld., mill acquired from Bowater.

4. Includes Boise Southern, DeRidder, La.

5. Includes Spruce Falls Paper & Paper (50.5% owned).

and 7 paper machines. In February, No. 6 was fitted with a Jagenberg Inc. rod clay-coater to improve the quality of the Aqua-Kote SUS beverage carrier board it produces. Improvements to No. 7 were completed in May but only announced recently (P&P, Nov., p. 31).

The current rebuild will increase No. 6's annual capacity to 350,000 tons and enable it to produce preprint linerboard and folding carton grades as well as carrier board. Capacity of coated SUS for the beverage industry, folding cartons, and preprinted linerboard—which are made on the mill's Nos. 2, 6, and 7 machines, respectively—will be raised to 647,500 tpy when the project is completed, the company said. Manville's president, Harry Sherman, said, "Our goal is to be the quality leader and low-cost producer in the coated paperboard field."

• Separately, Manville announced the indefinite shutdown of No. 1 machine at its West Monroe, La., mill due to depressed market conditions. The machine, which only resumed production in the middle of last year after a two-year shutdown, has capacity to produce about 300 tpd of semi-chemical medium. ■

South Korean company studies NSAQ process

Dong Bang Chemical Co. of Seoul, Rep. Korea, has announced its intent to study the feasibility of starting up a neutral sulfite anthraquinone (NSAQ) pulp mill at the site of a shutdown newsprint mill in Ocean Falls, B.C. According to a spokesman for the British Columbia Ministry of Industry & Small Business, the project is only in the conceptualization stage.

The preliminary proposal calls for Dong Bang and an as yet unnamed partner in British Columbia to produce 82,500 a.d. metric tpy of NSAQ market pulp, all to be exported to Rep. Korea. The Koreans and their consultant, Arbokem Inc. of Montreal, Que., estimate that it would cost about \$40 million to restart the Ocean Falls mill, which has been shutdown for five years and is now owned by the provincial government of British Columbia. ■

SALES/EARNINGS

Third-quarter profits plunge 43.7%

Poor pricing coupled with lower volume caused the U.S. paper industry to plunge 43.7% in the third quarter on a 0.5% increase in sales from the same period a year earlier, according to a P&P survey of results from 33 companies. Most companies blamed the unfavorable industry operating conditions on the strong dollar, sluggish U.S. industrial activity, and over-expansion in some key grades.

Packaging grades, paperboard, and

market pulp continued to show little better than a break-even performance at best, while uncoated white paper profits remained under pressure from competitive pricing. Some weakening in demand was also noted for newsprint and coated publication paper grades. The best performers were tissue producers and some specialty paper producers, who were probably less affected by the dollar and helped by lower fiber costs. Some companies

U.S. paper industry third-quarter results.

Companies	Third quarter (\$000)			
	Sales	Change 1985/84	Earnings ¹	Change 1985/84
Boise Cascade	\$934,230	-3.0%	\$20,330 ²	-37.9%
Bowater Inc.	218,975	5.4	16,504	-9.3
Champion International	1,330,435	17.6	37,940	-5.7
Chesapeake Corp.	161,911 ³	39.8	3,422 ³	-57.0
Consolidated Papers	171,898	3.2	23,911	42.8
Crown Zellerbach	788,200	-2.6	(84,600) ⁴	n.m.
Federal Paper Board	179,716	14.5	2,044	-85.2
Fort Howard Paper	362,882	3.2	44,166	17.9
Georgia-Pacific	1,752,000	-0.4	58,000 ⁵	-28.4
P. H. Glatfelter	64,904	-7.3	8,282	-74.7 ⁶
Great Northern Nekoosa	475,300	0.7	9,600	-68.5
Hammermill Paper	416,950	-0.2	5,631	-25.7
International Paper	1,100,000	-8.3	15,200 ⁷	-78.6
James River (7/28)	629,862	0.7	23,727 ⁸	6.0
Jefferson Smurfit	155,625	-7.9	3,838	-43.2
Kimberly-Clark	1,015,400	12.2	62,300	18.2
Longview Fibre (7/31)	110,445	-13.3	3,795	-52.2
Louisiana-Pacific	332,400	6.3	11,400	62.9
Mead Corp.	709,500	0.2	23,600	-51.0
Mosinee Paper	47,875	-1.2	2,564	24.3
Pentair Inc.	129,087	-9.0	4,589	-9.4
Pope & Talbot	81,952	-0.6	2,017	n.m.
Pottlatch Corp.	239,643	-3.8	11,270	0.9
Scott Paper	765,600	9.5	56,300	12.6
Southwest Forest Products	181,599	-10.6	(2,842)	n.m.
Stone Container	304,342	-4.4	(5,979)	n.m.
Temple-Inland	311,000	-4.0	17,500	-36.1
Union Camp	463,771	-6.8	20,150	-59.2
Wausau Paper Mills (8/31)	52,897	7.7	2,838	83.8
Westvaco	419,115	-6.0	23,166	-43.3
Weyerhaeuser	1,291,761	-33.8	38,607	-33.8
Willamette Industries	287,210	-2.8	14,760	-27.8
Total	15,487,435	0.5	474,030	-43.7

1. Income after taxes from continuing operations, excluding most significant items in both years.
 2. Includes pretax gain of \$6.7 million from sale of building materials distribution unit, offset by \$6-million charge related to employee separation.
 3. Includes results of Wisconsin Tissue Mills and Plainwell Paper acquired July 1, 1985.
 4. Loss includes aftertax charge of \$106.2 million from restructuring.
 5. Latest quarter is before loss of \$30 million from disposal of discontinued oil and gas unit; year-earlier quarter includes \$19-million pretax gain from sale of office building.
 6. Year-earlier period includes \$24.6 million gain from sale of West Carrollton, Ohio, mill in September 1984.
 7. Latest quarter includes pretax charge of \$290 million for early retirement and staff cuts.
 8. Adoption of LIFO accounting increased 1985 quarter income by \$4.2 million.
 n.m. = Not meaningful.

also reported higher profits from restructured wood products operations, despite depressed lumber prices and competition from Canadian imports.

A number of companies also took major charges in the third quarter related to organizational restructuring, asset sales, and personnel cutbacks. Most chief executives were not very optimistic about the remainder of 1985, although some expressed hopes for better industry conditions next year. "Given the expected levels of overall economic growth and the relative strength of the dollar, it is unlikely that we will see any substantial improvement in market conditions until next year," observed Peter J. McLaughlin, chairman and CEO of Union Camp Corp.

Dollar—the villain. The biggest villain in the dismal third-quarter performance was the strong U.S. dollar. "The strength of the U.S. dollar has been a major factor in depressing prices for Great Northern Nekoosa, our industry, and much of American manufacturing," observed William R. Laidig, chairman of GNN. "The problems caused by the strong dollar have been intensified by the startup of new industry capacity, including our own, at a time when the expansion rate of the economy has slowed." GNN reported a 68.5% decrease in profits on a 0.7% increase in sales for the third quarter compared with a year earlier.

Union Camp Corp. reported a 59% decline in earnings on a 6.8% drop in sales for the third quarter compared with a year earlier. "Although the U.S. dollar recently weakened slightly, it was not sufficient to generate meaningful improvement in export markets, particularly for linerboard," McLaughlin noted. Demand for uncoated white paper remained satisfactory, with increased shipments reflecting additional capacity from the new Eastover, S.C., mill. "However, pressure from imports and increased industry capacity have held prices below the levels of last year," he said.

Mead Corp. showed a 51% decline in profits on flat sales for the third quarter. "The strong dollar has made U.S. producers uncompetitive in export markets," commented Burnell R. Roberts, chairman and CEO. "Mead's paperboard prices deteriorated as export tonnage has moved back on-

shore. Pulp prices have continued to bump along the bottom," Roberts noted, "although we are beginning to see some positive impact from the weakening of the dollar. It will take another 20% to 25% decline in the value of the dollar before we are competitive in world markets," he said. Demand for coated paper was down as customers liquidated inventories, and a poorer combination of products reduced profitability.

Charges for restructuring. International Paper Co. showed a 78.8% drop in third-quarter earnings to \$15.2 million, although the latest period included a pretax charge of \$29 million for pension expense related to the company's early retirement program. "We are encouraged by the results of our cost reduction activities and improved manufacturing performance. However, our earnings continue to be affected by the weak pricing and demand environment in our industry," stated IP's chairman and CEO, John A. Georges. As part of this cost reduction effort, the company has trimmed its salaried work force by 1,000 people.

Crown Zellerbach Corp. reported a slight decline in operating earnings for the third quarter, although a substantial charge related to the company's restructuring program resulted in a net loss. The aftertax charge of \$106.2 million resulted in a net loss for the third quarter of about \$84.6 million.

A 36.1% decline in profits from a year earlier was reported by Temple-Inland Inc., which it attributed mainly to price weakness in corrugated boxes and bleached board. Chesapeake Corp. reported a 57% decline in third-quarter earnings, while net income at Federal Paper Board Corp. was down 85.2%.

Tissue is bright spot. Tissue producers were some of the strongest third-quarter performers. Kimberly-Clark Corp. rolled up an 18.2% increase in third-quarter earnings and said that the major factor in the increase was higher sales of its Huggies diaper line in North America. Scott Paper Co. reported a 12.6% increase in profits for the period. Fort Howard Paper Co. posted a 17.9% increase in third-quarter earnings mainly due to higher unit volume and prices on tissue products. ■

LABOR

PPIRB chairman calls for cooperation to end strife

The Pulp & Paper Industrial Relations Bureau's (PPIRB) chairman and CEO, Don Saunders, told the Conference Board of Canada at a meeting in Ottawa this fall that more cooperation is needed in labor negotiations as a result of the depression in British Columbia's forest products industry.

Pointing out that the British Columbian industry is in "considerable trouble because we are not making any money," Saunders said that the biggest challenge facing labor and management is to "jointly find ways to regain company profitability without lowering the standard of living of company employees."

Twelve management and labor representatives of the British Columbian industry formed a committee in May and have met intermittently since then to try to work out a new bargaining structure in time for the start of labor negotiations next spring. Contracts expire next June 30 and July 15. ■



PPIRB chairman Don Saunders urged labor and management to cooperate in solving problems in British Columbia's forest products industry.

Unions settle at Skowhegan; strike notice at Counce

Workers in the three striking unions at the Skowhegan 600-tpd lightweight coated paper mill of Scott Paper Co.'s S.D. Warren Co. division in Hinckley, Maine, reached agreement with the

The year that was

1985 will go down in the economic record books as the year in which much was promised and little delivered—particularly in the paper industry. In the collective bargaining arena, new labor agreements were negotiated in the airline, trucking, and rubber industries. At G.E., Westinghouse, and American Motors, the tone of prior negotiations continued. Chrysler's profits produced the expected "catchup" pressures.

The rubber workers' union (URW) negotiated a settlement, with the Big Four tire makers calling for a \$0.43/hour wage increase over the three years of the contract. The Teamsters also reached an agreement for a three-year term, with an increase of \$1.50/hour, covering 200,000 employees. General Electric and Westinghouse both negotiated similar three-year settlements, calling for lump sum payments in the first year and increases of 3% in each of the next two years.

Airline industry negotiations were concessionary in nature as deregulation continues to affect the industry's labor relations. As the role of the nonunion airlines increases, companies with unionized work forces seek ways to compete with them. American Motors, negotiating with two UAW locals in Wisconsin after threatening to close the plants, reached an agreement when the union made wage and time off concessions in exchange for job security guarantees.

PAPER INDUSTRY. Increasingly, bargaining results in the paper industry reflect these concessionary trends. Through August 1985, the paper industry was settling its labor agreements with wage increases at almost a full percent less than it had in 1984. This doesn't fully take into account the fact that over 50% of the agreements bargained in 1985 included cash settlements, which averaged almost 4%. Cash was often given in exchange for productivity improvements, which were (and are) essential for companies to become cost competitive in what has become a worldwide market.

The paper industry was for many years fourth or fifth in the manufacturing labor cost hit parade. The steel, auto, chemical, and petroleum industries all had employment costs well above those of the paper industry. In the late 1970s, the paper industry began a dramatic shift upward. In 1975, the chemical industry was, on the average, paying \$0.20/hour more than the paper industry. By 1985, these roles had been significantly reversed. In

fact, in the last eight years, paper has had the largest increase in average hourly earnings of all those industries mentioned (Figure 1). From 1960 to 1985, paper industry average hourly earnings have increased three times as rapidly as those of U.S. manufacturing as a whole. In a year in which 42% of workers received a wage freeze or decrease, paper industry workers did reasonably well. One effect of the current environment has been the elimination of regional patterns.

As companies seek to be competitive in a world marketplace, cost reductions in labor, as well as in energy, raw materials, etc., is essential. Companies are therefore looking at profit margins rather than regional patterns. In this year alone, we have seen a decline of almost 20% in linerboard exports and an increase in coated paper imports of up to 80%—almost 9% of the U.S. market.

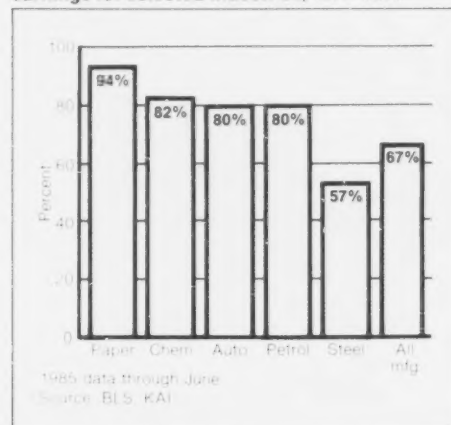
Another important element in paper industry labor costs are the significantly higher level of employee benefits and "pay for time not worked" than any of the continuous process industries we've looked at. I'm sure these will be addressed in 1986.

1986 BARGAINING. While concessions should dwindle by the end of 1986, they won't disappear. The steel industry is still in a survival mode, and its revised bargaining arrangement should produce variations in individual company settlements. The petroleum, glass, aluminum, and farm equipment industries and Bell System negotiations fill out the 1986 calendar. All in all, it should be a heavy bargaining year with different results in this new era of bargaining.



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FIGURE 1: Percent change in average hourly earnings for selected industries, 1977-1985.



PAPERMAKING: Customized products increasing in popularity

Consumption. Developments in paper furnish additives have helped manufacturers improve forming and retention over the last decade. Today, the trend appears to be toward operational aids, such as chemicals for in-house water treatment and equipment life extenders. Suppliers are seeking to customize papermaking additives since many produce a number of specialties. Meanwhile, commodity chemicals have been threatened by the emerging acceptance of alkaline papermaking. Chemical modification could grow significantly among all paper manufacturers if this trend continues.

Most papermaking chemistry is centered around the addition of rosin size, alum, dry- and wet-strength resins, and starch, and a combination of inorganic filler materials. Typical alum/rosin systems employ a 3:2 ratio, depending on the pH, other additives, paper strength requirements, and loading. Alum consumption in U.S. papermaking operations is estimated at 400,000 tpy, with an almost equal amount used in effluent treatment. Consumption of rosin is difficult to determine since many paper companies use the byproduct of in-house kraft pulping, but it is assumed to be in the range of 250,000 tpy. Dry-strength resins, such as anionic acrylamide, improve burst and fold properties. Addition varies between 2 and 12 lb/ton, depending on the chemistry and desired paper properties. Melamine and other wet-strength resins are applied in small amounts on most grades (under 3% based on dry weight of fiber) and in larger amounts for wet-strength papers. (For starch consumption, see starch survey, p. 83 of this issue.)

Among popular specialties are biocides, water-based antifoams, felt conditioners, and retention and drainage aids. Consumption of these chemicals is hard to identify since many suppliers sell not only the product but the technical service as well (which can alter consumption frequently). Since each paper machine has its own recycle rates, freshwater hardness, fiber

composition, and many other individual specifications, suppliers attack operational problems such as pitch deposit and fungus buildup with a blend of chemicals.

A rough estimate of consumption for dry retention aids is less than 10,000 tpy, while applied biocides are nearly the same. Dispersants and surfactants are usually applied together, so consumption figures do not really mean much. A few mills use chlorine dioxide to clean out machine equipment. This may become more prevalent if the new capacity (mostly in Canada) for producing sodium chlorate (the chief reactant) drives its price down. All specialties are expected to grow significantly during the next 15 years, as suppliers and paper chemists seek out new ways to extend fiber, run cleaner operations, and obtain better overall retention and formation in papermaking.

No papermaking report would be complete without a word about alkaline papermaking. This technological advance has been slow to gain acceptance in U.S. operations, with an estimated 10% of all paper produced now using its technology. If that were to grow to 50% by the end of this decade, major consumption reductions in filling kaolin and alum would result. Chemical consumption would probably increase, especially in the specialties area. Synthetic sizing agents, including the now popular ASA and AKD, would grow in use tremendously, eliminating rosin addition. These chemicals represent a

\$24-million market today, which should double in the next five years.

Prices. For the specialty chemicals, most range from just under a dollar to two dollars per pound (based on dry weight of the product). These prices tend to rise incrementally as the market will bear, and many price increases are attributed to service costs. Severe problems (such as microorganism buildup) may multiply the cost of blends by as much as a factor of two. Figure 1 estimates the dollar volume growth for specialties, taking into account moderate growth for alkaline papermaking.

For the commodities, pricing is somewhat easier to determine. Rosin, though much of it comes from in-house sources, is expected to remain at the \$35/ton level for a 70% pale paste grade, while a slightly lower price is typical for the less used dispersed grade. Alum producers may increase prices if processing and raw material costs continue to rise. List prices for papermakers' alum averages around \$140/ton, with discounting and freight variations. Supply of all these chemicals exceeds demand, so market conditions should not play a role in price fluctuations for the next several years. ■

FIGURE 1: Consumption of alum and rosin in U.S. papermaking.

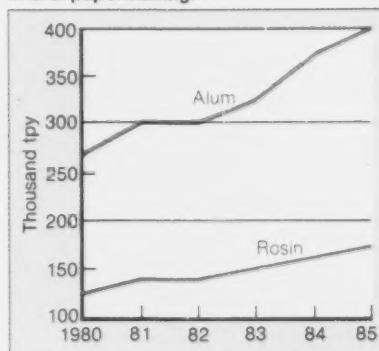
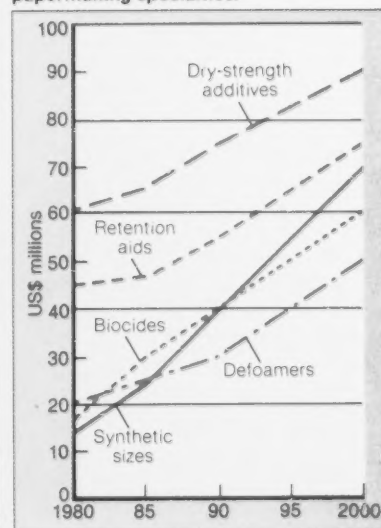


FIGURE 2: Present and future value of papermaking specialties.



THIRD SALARY SURVEY



Readers reported a median income of \$46,000 this year; administrators, scientists, and consultants were top earners

Median income up 4% from last year

By KENNETH E. SMITH, Executive Editor

■ This is *Pulp & Paper's* third annual reader salary and opinion survey. The August 1985 issue (p. 76) contained a postage-paid questionnaire that readers were asked to complete and mail back to us by Oct. 18. A total of 1,689 responses were received by the deadline and were turned over to an independent firm for data processing.

This year the median income of all respondents was \$46,000—a 4% increase over last year's figure of \$44,000. The median income of all respondents in 1983 was \$41,000. Benefits received averaged between \$5,000 and \$10,000, as they did the two previous years. The *P&P* survey figures compare favorably with those reported for engineers in the pulp and paper industry in a survey by the Engineering Manpower Commission of the American Assn. of Engineering Societies (*P&P*, March 1985, p. 118). That survey showed a median salary for paper industry engineers of \$40,000 in 1984, up 3.5% from 1983.

The profile of the average respondent has changed very little since the first survey. The average respondent this year is male (99%), lives in the Southeast (34%) or the Midwest (24%), works for a large wood products/pulp/paper manufacturer (78%) in mill operations (17%), engineering design (14%), or technical service/quality control (13%), and obtained his highest degree in mechanical engineering (17%), business (17%), paper science and technology (16%), or chemical engineering (16%).

The average respondent seems happy in his job and very stable. He has been with his present employer ten years. Only 14% of the respondents changed jobs in the past three years. Most respondents seem satisfied, as 90% reported they like their jobs. The majority (85%) say they would stay in the paper industry if they changed jobs. Not surprisingly, most (90%) felt their

companies listen to and value their opinions.

Some other interesting statistics follow:

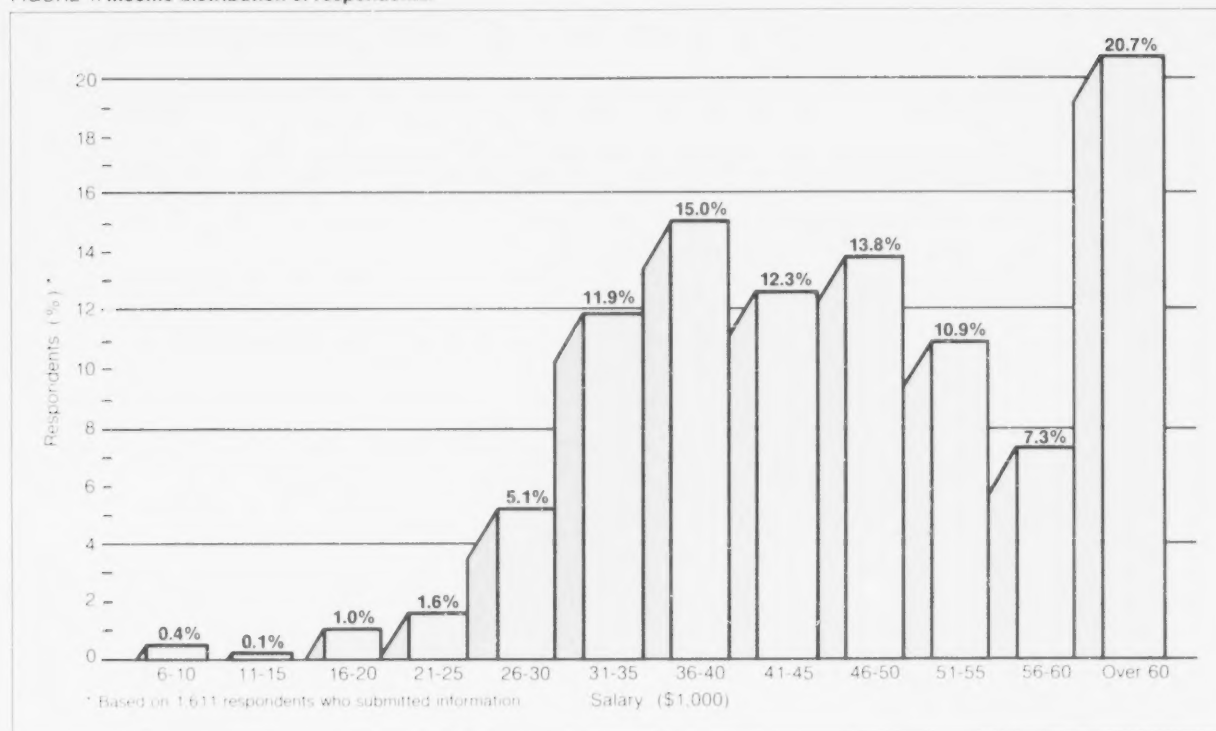
Compensation—

- Respondents receive an average of ten paid holidays and three weeks of vacation per year
- Salaries were increased an average of twice in the past three years
- The last pay increase received averaged 7%
- 88% of all respondents are not paid overtime
- 94% receive annual salary reviews based on performance/merit (55%), cost of living (4%), or both (30%).
- The average respondent has not had a promotion in the past three years.

Personal—

- 99% of all respondents work full time; only 1% are self-employed
- Only 15% of all respondents are suppliers or consultants to the industry
- 65% of all respondents working for wood products/pulp and paper producers work at mill sites
- 64% of the respondents have at least team or unit management responsibility
- 45 hours is the average work week
- 64% have been in the paper industry for their entire careers
- 32% are between 31 and 40 years old; 28% are between 41 and 50
- 62% have at least bachelor's degrees; 22% have advanced degrees
- The average respondent has had 10 to 14 years' work experience since leaving school
- 62% have had no more than two employers during their careers
- 64% belong to a technical or professional society; only 39% have received management training in the last two years
- 59% rated their morale "above average."

FIGURE 1: Income distribution of respondents.



SURVEY RESULTS. As in previous years, survey results are presented here in a series of tables (Tables 1 through 16) comparing compensation with a number of variables, including degree, discipline, work type and experience, size and type of employing organization, and supervisory experience.

This year only 2% of all respondents were Canadian. Because of this small response, meaningful data for Canadian respondents could not be obtained. However, the median income for Canadian respondents is \$40,000. Median income for Canadian respondents in 1984 and 1983 was \$37,000 and \$38,000, respectively. Respondents were asked to convert their incomes to U.S. dollars, and these figures may reflect changes in the strength of the dollar more than they do changes in respondents' earnings.

Data given in the tables are for all respondents, including the Canadians and others outside North America (0.5% of all respondents). Income figures reported in all tables were obtained by adding any bonuses or additional income reported by respondents to their reported gross salaries. Survey respondents were asked to estimate the value of all benefits received by them as part of their compensation packages.

Table 2 shows a breakdown of benefit values reported by respondents over certain ranges. However, the value of certain benefits, such as company cars, life and medical insurance, and retirement plans is often hard to estimate, and the data in Table 2 is probably not reliable. Therefore, Table 3, which lists tangible benefits usually received as part of compensation packages compared with the percentage of respondents who normally receive them, is more useful for comparison purposes. Table 3 shows that company-paid medical, life, and dental insurance along with some type of retirement pension plan are received by at least 80% of all survey respondents.

TABLE 1: Salary distribution of all respondents.

	Salary (\$000)		Change (%) [*]
	1985	1984	
Lower decile	31	30	3
Lower quartile	37	36	2
Median	46	44	4
Upper quartile	58	55	5
Upper decile	74	70	5

Benefits value (\$000)	Respondents (%)	
	1985	1984
0 to 1	0.4	0.4
1 to 2	3.6	3.2
2 to 3	5.3	4.7
3 to 4	6.2	7.0
4 to 5	5.9	4.9
5 to 10	28.5	31.2
10 to 15	23.7	25.1
15 to 20	12.7	10.9
20 to 50	13.0	12.0
>50	0.8	0.7

TABLE 2: Employee benefits, all respondents.

TABLE 3: Benefits of all respondents.

Benefit	Respondents (%)	
	1985	1984
Medical insurance	94.7	92.7
Life insurance	91.1	91.3
Profit sharing	30.2	57.9
Retirement pension plan	86.1	86.1
Company car	13.6	41.1
Bonus plan	25.6	36.9
Stock option plan	43.3	34.9
Dental insurance	79.8	47.0
Travel budget	27.0	16.5
Education allowance	51.3	27.0

EVALUATING THE RESULTS. Respondents reported that their last salary increases averaged 7%. They also reported that they had received an average of only two salary increases in the past three years, while at the

same time indicating that their salaries are normally reviewed on an annual basis. This data is similar to that reported in the two previous surveys and seems to indicate that salary freezes have been in effect for many re-

TABLE 4: Income and type of employment organization, all respondents.

Employing organization	Income (\$000)					Change in median '84/'85 (%)	Respondents
	Lower decile	Lower quartile	Median	Upper quartile	Upper decile		
Academic	41	41	49	49	56	8	3
Government	19	19	36	40	40	16	4
Wood/pulp/paper—engineering	30	37	45	57	72	0	193
Wood/pulp/paper—manufacturing	31	37	46	56	73	4	1,053
Consulting firm	37	46	51	63	80	0	102
Self-employed consultant	34	40	75	80	80	25	6
Wood/pulp/paper—supplier	35	42	50	60	69	11	127
Wood/pulp/paper—converter	34	35	43	70	95	2	37
Other	22	34	45	60	80	0	67

TABLE 5: Income and principal work function, all respondents.

Principal function	Income (\$000)					Change in median '84/'85 (%)	Respondents
	Lower decile	Lower quartile	Median	Upper quartile	Upper decile		
Administration	31	41	55	78	115	-5	183
R & D	30	38	46	56	75	2	171
Consulting	36	44	51	60	78	1	65
Engineering design	33	37	45	55	65	4	221
Teaching/academic	39	39	41	41	56	5	3
Product development	30	37	44	62	71	15	32
Production and mill plant oper.	33	39	49	56	73	8	273
Engineering/maintenance	33	36	42	52	63	4	167
Sales and marketing	35	42	52	61	79	6	155
Technical service							
quality control	28	33	40	50	61	2	204
Other	30	35	45	56	72	12	130

TABLE 6: Income and size of employing organization, all respondents.

Organization's annual sales (\$ million)	Income (\$000)					Change in median '84/'85 (%)	Respondents
	Lower decile	Lower quartile	Median	Upper quartile	Upper decile		
< 100	31	39	48	60	80	9	250
100 to 499	31	36	46	55	67	0	246
500 to 999	31	38	48	60	80	6	184
1,000 to 2,000	32	38	47	58	78	2	282
> 2,000	32	38	46	59	74	4	488
Do not know	27	33	41	50	60	7	108

TABLE 7: Income and level of supervisory responsibility, all respondents.

Supervisory responsibility	Income (\$000)					Change in median '84/'85 (%)	Respondents
	Lower decile	Lower quartile	Median	Upper quartile	Upper decile		
None	27	33	38	47	54	-5	218
Indirect or staff	31	35	42	51	63	7	356
Team or unit	32	37	44	52	60	4	254
Project or section	33	38	46	55	65	2	300
Major department or division management	37	46	56	70	87	3	379
Corporate management of organization	38	53	73	109	150	4	91

TABLE 8: Income and professional experience, U.S. respondents.

Years since school	Median income (\$000)
0 to 4	33
5 to 9	39
10 to 14	45
15 to 19	49
20 to 24	52
25 to 29	56
30 to 34	55
35 to 39	55
40 to 44	47
> 44	50

spondents during the past three years. Reader comments confirm these freezes. The overall increase in median salary of 4% between 1984 and 1985 is slightly below the 4.6% inflation rate. This trend probably reflects the cur-

rent economic slowdown.

Table 4 shows that consultants and suppliers to the industry reported the highest median incomes (\$51,000 and \$50,000, respectively), which is really no surprise.

Discipline	Income (\$000)					Change in median '84/'85 (%)	Respondents
	Lower decile	Lower quartile	Median	Upper quartile	Upper decile		
Forestry/agriculture	31	41	51	70	85	4	61
Chemistry	34	40	48	61	77	0	125
Mechanical engineering	33	38	47	58	68	6	235
Chemical engineering	31	36	47	58	72	2	221
Civil engineering	36	38	47	62	78	4	61
Electrical engineering	37	44	51	56	70	6	71
Industrial engineering	25	40	45	51	62	2	23
Mathematics/physics	26	42	55	80	108	19	14
Computer science	43	43	43	43	43	72	1
Biology/life science	22	31	41	47	60	17	25
Paper science and technology	32	36	44	54	70	7	226
Environmental science	28	32	40	48	61	5	12
Business	31	37	48	60	78	-2	243
Liberal arts	32	40	50	64	85	0	42
Other	29	35	44	58	75	0	58

TABLE 9: Income and educational field—bachelor's degree only, all respondents.

Years since school	Highest degree	Income (\$000)					Change in median '84/'85 (\$000)	Respondents
		Lower decile	Lower quartile	Median	Upper quartile	Upper decile		
0 to 4	B.S.	25	30	33	37	42	0	29
	M.S.	37	40	41	44	45	24	11
	Ph.D.	33	37	38	46	46	2	6
5 to 9	B.S.	31	38	43	47	52	-2	45
	M.S.	39	42	47	49	58	-5	11
	Ph.D.	24	37	43	52	59	-24	14
10 to 14	B.S.	35	37	46	55	72	-17	47
	M.S.	42	47	50	72	75	-1	18
	Ph.D.	33	42	46	52	57	-32	18
15 to 19	B.S.	38	46	50	60	75	0	55
	M.S.	46	51	66	85	115	0	17
	Ph.D.	42	44	55	67	70	30	16
20 to 24	B.S.	40	45	58	66	76	18	27
	M.S.	38	49	57	65	93	14	13
	Ph.D.	44	57	59	72	84	1	12
25 to 29	B.S.	39	50	54	67	80	3	17
	M.S.	46	55	61	70	70	3	6
	Ph.D.	0	0	60	90	150	0	5
30 to 34	B.S.	41	53	56	74	80	-15	14
	M.S.	43	47	74	87	87	0	6
	Ph.D.	27	27	40	40	109	0	3
35 to 39	B.S.	46	54	60	68	80	57	15
	M.S.	52	52	52	78	78	29	2
	Ph.D.	40	40	52	52	66	23	3

TABLE 10: Income, professional experience, and educational level, all respondents.

Years since school	Income (\$000)				
	Forestry/agriculture	Chemistry	Mechanical engineering	Chemical engineering	Civil engineering
0 to 4	34	38	33	32	32
5 to 9	30	38	38	39	37
10 to 14	47	44	42	51	47
15 to 19	56	49	48	50	47
20 to 24	45	49	53	55	50
25 to 29	52	56	61	53	59
30 to 34	68	61	51	56	56
35 to 39	54	55	56	62	74
40 to 44	0	95	57	0	40
>44	0	0	50	130	0

TABLE 11: Income, professional experience, and educational field, bachelor's degree only, all respondents.

TABLE 12: Income and number of years with current employer, all respondents.

Years	Median income (\$000)	Change in median '84/'85 (%)	Respondents
5 or less	40	11	165
6 to 10	36	-2	96
11 to 15	36	0	97
16 to 20	42	10	114
21 to 25	45	12	113
26 to 30	45	9	93
31 or more	44	7	86

TABLE 13: Income and number of full-time employers to date, all respondents.

Employers	Median income (\$000)	Change in median '84/'85 (%)	Respondents (%)
1	41	2	518
2	46	4	437
3	50	6	298
4	50	2	161
5	50	0	80
6 or more	50	2	44

TABLE 14: Income and type of wood/pulp/paper company, all respondents.

Type	Median income (\$000)	Change in median '84/'85 (%)	Respondents
Wood products	54	28	15
Pulp/paper/paperboard	44	4	835
Woodlands operations	49	8	46
Chemical byproducts	46	15	7
Corporate or administration	57	11	213
R & D	46	2	162

TABLE 15: Income and number of years of management experience.

Employees	Median income (\$000)	Change in median '84/'85 (%)	Respondents
None	37	5	91
5 or less	40	8	106
6 to 10	40	0	79
11 to 15	45	2	83
16 to 20	44	4	94
21 to 25	47	9	82
26 to 30	49	8	74
31 or more	49	16	53

TABLE 16: Income and number of employees managed, all respondents.

Employees	Median income (\$000)	Change in median '84/'85 (%)	Respondents
None	41	5	110
1 to 5	45	9	117
6 to 20	47	11	107
21 to 50	48	4	53
More than 50	49	6	59

For the third time, respondents whose principle work function is administration reported the highest median income (Table 5) at \$55,000, followed by those in sales and marketing (\$52,000), and consulting (\$51,000). No clear trend is apparent when median income is compared with size of employing organization (Table 6), except that the lowest income was reported by respondents who do not know their company's annual sales. Table 7 shows that median income correlates directly with level of supervisory responsibility.

Table 8 shows—as it did in the previous surveys—that the median income of all respondents increases with years of professional experience through 29 years. After that point median income decreases. These data seem to confirm the problem of salary compression; i.e., that salaries of recent graduates and newer employees advance faster and often surpass those of older, more experienced employees.

Table 9 shows some changes from the previous surveys. The highest median income (\$55,000) was reported by respondents whose highest degree was earned in mathematics/physics. In second place (\$51,000) were respondents whose highest degrees were earned in either forestry/agriculture or electrical engineering. Third place (\$50,000) went to respondents who earned their highest degrees in liberal arts. In both of the previous surveys, respondents with their highest degrees in liberal arts reported the highest median incomes. The improved status of electrical engineers probably reflects the growing importance of process control systems to the industry. Other engineers—civil, chemical, and mechanical—did not fare as well and tied with a reported median income of \$47,000. (P&P's September 1985 issue discusses the careers and income of "traditional" engineers in detail.)

A comparison of Tables 12 and 13 shows that job hopping pays off to some extent. Respondents who have been with their current employer for more than 21 years reported the highest median income at \$45,000, when income was correlated with years with present employer. However, respondents who have had three or more employers in their careers reported a median income of \$50,000 (Table 13). The latter group represents 38% of all respondents.

As with both previous surveys, no noticeable difference in income and benefits was seen between geographic regions within the U.S.

RESPONDENTS COMMENT. Many interesting comments were made by survey respondents. Most addressed the problem of salary compression or resentment by salaried professionals that their income has not increased as much in recent years as that of hourly workers at their mills who are covered by union contracts. Several respondents also expressed concern that their careers would suffer because companies had cut back on technical and management training efforts during hard times.

The editors of *Pulp & Paper* hope that this annual survey will be useful to our readers and that it contains some data of interest to all industry professionals. Reader comments on the survey or on *Pulp & Paper* itself are welcome and should be addressed to:

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Use of cornstarch in papermaking is changing with new technology

Exclusive P&P survey finds equipment innovations and new furnish chemistry influencing, and probably diminishing, native cornstarch use

By MICHAEL J. DUCEY, Technical Editor

■ Cornstarch has been one of the most popular additives in papermaking since the birth of the industry. Stable price, ample supply, and application versatility are key reasons for its wide appeal. As the industry has matured over the last two decades, the use of cornstarch has been under intense pressure, most notably from the development of retention aids for use in the wet end and now from synthetic latexes in surface applications.

Few starch suppliers seem to be responding to this challenge, while competitors are actively seeking a greater share of the market through research and development. Mills are also asking for and getting discounted purchases, either through purchasing formulas developed in-house or by pitting suppliers against one another when application trials arise. Industry sources agree, however, that cornstarch will remain a major ingredient in papermaking processes for a long time, but whether its consumption per ton of paper produced will change is still in question.

STARCH APPLICATIONS SHIFT. In the early 1970s, cornstarch consumption in the U.S. stood at 1.85 billion lb/year. Many paper manufacturers used it as a major additive in the beater room, mainly to improve inter-fiber bonding and as a rosin supporter. Much of this consumption has been replaced by gums and retention aids since starch had poor retention after stock preparation. The amount of starch used in these applications was about 115 million lb—7% of the total starch consumed.

The remainder was used in surface applications at the size press or in coating formulations. Not much has changed in these applications, with the possible exception of increased solids and modified starch additions. These applications brought out a number of onsite starch modification developments as the demand for specialized uses across diversified grade structures in many mills became a reality.

Wet-milling corn has changed dramatically over the last half century. Three major shifts occurred: the trend from open-air to enclosed processing, the substitution of powered equipment for processes based on gravity, and the move from batch operations for processing corn products to continuous operations. The integrated mill concept has taken hold, and now innovations in process control and automation are improving on it. New markets have evolved for corn products as well, as total shipments of product continues to rise (13% from 1983 to 1984, with similar projections for this year).

One independent survey named 12 paper companies as the largest consumers of cornstarch (including corrugators), accounting for more than 45% of total consumption. Smaller paper companies, brewers, chemical manufacturers, and food producers account for the other 1.75 billion lb consumed domestically.

WET END ADDITION. Unmodified pearl starch was the chief wet end additive for many years. Today, starch derivatives such as cationic and amphoteric are used. These materials exhibit electrical properties that modify the charge of anionic cellulose, improving formation and retention. Too much nonionic starch is lost in this process, while the modified products are commonly retained at a 70% to 80% level or better, depending on the existing whitewater chemistry, furnish, and turbulence on the wire.

Pulp & Paper surveyed a cross section of U.S. mills on starch consumption. Most of the mills confirmed that starch helps with hydrogen bonding at fiber crossings, enhancing dry strength properties such as burst, tear, and tensile. Common addition points seem to be at the fan pump or the machine chest. Ideally, starch should be added close to the headbox since it is affected by unit

TABLE 1: Annual consumption of starch by type (million lb).

Unmodified	2,300
Ethylated	130
Cationic	250
Oxidized	21
Acid-thin boiling	35
Other*	24

* Pregelatinized, dextrins.

operations that may alter its chemical properties. Starch helps "refine" the furnish without mechanical action and can increase drainage efficiency at the former.

Addition rates vary by grade. The survey found the greatest users per ton of pulp to be the coated groundwood producers. Starch consumption between 20 and 30 lb/ton was common, and users cited IGT pick resistance as the property most affected. Retention of fines is increased as well. Producers also felt that runability was improved, resulting in fewer breaks at the size press and in coating due to internal strengthening of the sheet.

Second to coated groundwood were linerboard producers, with application rates in the range of 10 to 20 lb/ton. Although a large number of these producers do not add wet end modified starches, those who do cited improved internal bonding as the major benefit. Many linerboard and containerboard manufacturers reported that market conditions often dictate additive use, and since the market for these products is somewhat depressed today, it is no wonder that many mills have chosen not to add starch. Potato starch, which exhibits an anionic charge naturally (due to bound phosphate), is derivable and used to a small extent. Bleached board producers use starch at rates less than 10 lb/ton, mostly to help promote drainage. One source noted that a few paperboard producers have had good strength improvements from larger (10- to 30-lb) additions.

In fine paper production, the use of starch varies widely. Addition rates fall between 5 and 15 lb/ton—the latter figure corresponds with specialty producers in the heavyweight category. One mill reports addition throughout that range, depending on the softwood-to-hardwood ratio, with the upper-end figure applied for an increased hardwood furnish. Many producers reiterated claims of improved runability after forming.

A number of smaller (tonnage) mills have curtailed their use for a couple of different reasons. In the Northeast, BOD₅ increases, particularly in the winter months, will sometimes limit starch addition. In the South, where softwood-rich furnishes are more common, production runs without starch sometimes do not show any adverse effect. Two mills rejected starch use because their end products did not exhibit the desired smoothness characteristics.

The paper product least likely to have starch is newsprint, particularly if the furnish consists of secondary fibers. The survey did find a couple of mills using 10

lb/ton, with users citing reduced linting and increased fines retention. Since 1980, starch has penetrated this market, and as its acceptance continues, newsprint mills could evolve into large starch consumers.

Specialty mills seem to use the most starch as a result of unique product lines. Molded pulp mills fell into this category since many employ excessive amounts to bulk up or thoroughly coat some products.

P&P was not able to obtain data from mills using alkaline papermaking systems, but suppliers have noted that starch consumption could increase as a result of conversions to alkaline. Switching to an alkaline system increases filler additions, which can cause a decline in strength. Starch suppliers feel that this strength loss can be overcome by increased additions of cationic starch.

One supplier estimates the consumption of wet end cornstarch at 250 million lb, or 20% of the total. All of it is of the modified variety, the greatest amount being of the cationic type. Some respondents expressed doubts about the ability of amphoteric starch to work in some mills, particularly where water hardness and pH vary, but these doubts have yet to be substantiated.

SURFACE SIZING. Very little is new in the application of starch for surface sizing. Starch pickup is still a function of its viscosity, percent solids, and temperature, as well as machine speed and paper grade. For dryer-limited machines, higher solids have been successful when machine speeds have increased and lower moisture pickup is desired. Unfortunately, starch does not help opacity, brightness, or gloss, even with an increase in solids. It does, however, increase surface-directional strength, water resistance, and printability when used with certain synthetics.

The greatest single innovation in size-press applied starch is the implementation of the thermochemical starch cooker, particularly Grain Processing Corp.'s ammonia-persulfate starch cooker. This device enables mills to modify pearl starch onsite, thus eliminating the need for delivered modified products. Some 150 of these units are now operating, primarily to vary the viscosity of size press starch. Ethylated starches have been the primary modified starch in this application and still account for a good share due to their ability to provide a uniform film and increase ink holdout.

Calender sizing with starch is prevalent in most paperboard mills. Starch is applied via a nip or sprayed,

FIGURE 1: Starch consumption by grade.

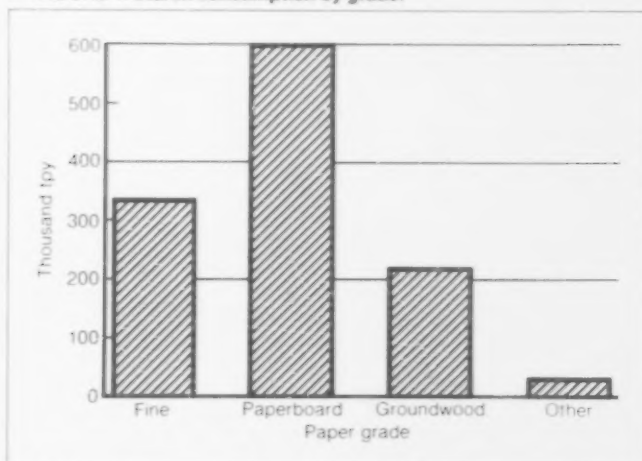
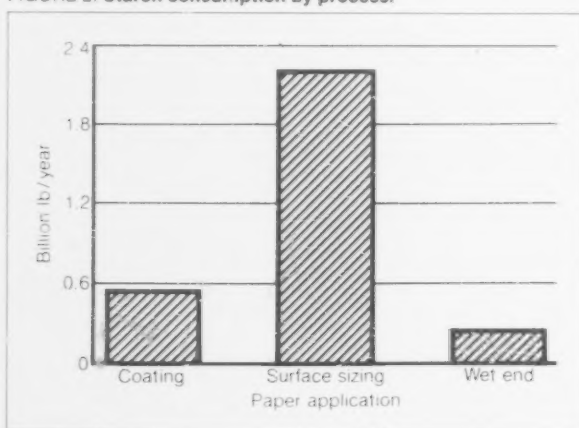


FIGURE 2: Starch consumption by process.



and starch consumption is usually less than 5 lb/ton. Again, ethylated starches are gaining an increased share in this application due to their improvement of smoothness and finish qualities. Reduced ink penetration, scuff resistance, and better printability result from proper application, as witnessed by one kraft paper producer and several bleached board manufacturers.

COATING. Starch is the major ingredient of coating formulas and will remain so for the late 1980s due its price, binder characteristics, and adhesion properties. A few trends are developing that could be the beginning of a "revolution" in coating formulations.

A large amount of starch for paper coating is employed as onsite-converted, unmodified cornstarch. One source estimated the breakdown of delivered cornstarch to be 47% thermally converted, 23% enzyme converted, and 30% modified. No rheological advantages have been proven with regard to batch or continuous operations, but some economic benefits are evident. The survey found that large mills tend to have enzyme-converting systems, especially if they coat paper. A good portion of medium-size (500-tpd range) and smaller coating mills make up starch in thermal and thermochemical cookers. A few mills have adopted automated coating kitchens (P&P, Dec. 1984, p. 73, and May 1985, p. 78) that have production loops for adhesive inputs.

Competition for starch used in coating binders may reach a head by the end of this decade. Quality and economics are both reasons for exploring alternatives. According to one source, during the recession of 1972 when paper machine operating rates dropped by 10% or more, synthetic latexes were used to gain quality advantages in certain coated grades such as publication papers. After operating rates increased, the latex additions remained, and their consumption grew. The last recession brought similar activity and a rise in consumption.

In the late 1960s, styrene-butadiene latex (S-B latex) held a 5% share of the coating adhesive market, while in 1980 that share rose to 20%. In the last five years, growth in S-B latex consumption has been close to 1% per year. An industry observer reported an example of how a producer of web offset No. 5 publication paper changed its starch-latex ratio from 12:4 to 6:12, improving gloss by a few points as well as helping certain printability characteristics. These shifts in quality at the lower end of the coated grades will eventually squeeze other middle

grades, while No. 1 and other premium grades try S-B latex alone for coating adhesion. Two mills rejected such efforts due to printer problems with fine paper, but publication paper producers supported this substitution.

European products, with their high synthetic latex content, have been well received, perhaps pushing U.S. producers to improve quality with this material. Europeans do not have the starch available (most of their starch is of the cationic potato variety), and with their increased use of inorganics in the sheet (alkaline papermaking), it is no wonder they challenge U.S. products.

Mills have turned to ethylated starch as a binder to upgrade printing quality, and with a \$0.70 to \$0.80/lb cost differential, starch consumption should grow according to industry growth as a whole.

Coating equipment has changed some formulations involving starch. The installation of short-dwell-type coaters has altered rheological characteristics of some coatings, and starch reevaluation is needed. One supplier noted that starch must be converted "thinner," and some of its binding power is lost. In order to regain that power, solids are cut back and S-B latex is used. The survey found that the starch component in any coating application is between 14% and 19% (by weight) of the formula, depending on the equipment employed, paper grade, and desired surface characteristics. ■

FIGURE 3: Historical binder consumption activity.

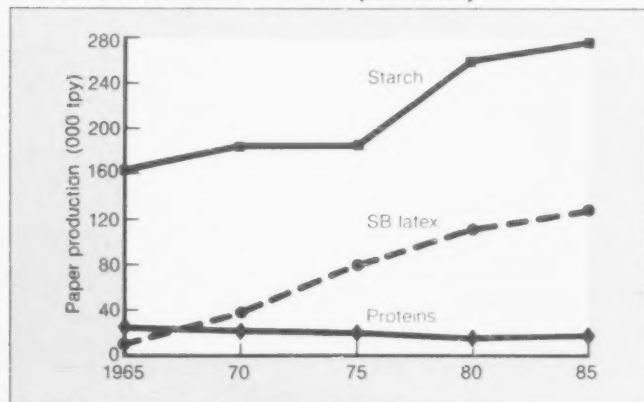


FIGURE 4: Starch capacity for industry suppliers.

American Maize-Products: 820 million lb		
Hammond, Ind.		600
Decatur, Ala.	120	
Dimmitt, Texas	100	
Cargill: 907 million lb		
Cedar Rapids, Iowa	277	
Dayton, Ohio	240	
Eddyville, Iowa	150	
Memphis, Tenn.	240	
CPC International: 903 million lb		
Argo, Ill.		730
Stockton, Calif.	53	
Winston-Salem, N.C.	120	
A D M: Corn Sweeteners: 615 million lb		
Cedar Rapids, Iowa	365	
Clinton, Iowa	250	
Grain Processing: 660 million lb		
Muscatine, Iowa		660
Hubinger: 116 million lb		
Keokuk, Iowa	116	
National Starch & Chemical: 250 million lb		
Indianapolis, Ind.	250	
Penick & Ford: 400 million lb		
Cedar Rapids, Iowa	400	
A E Staley Mfg.: 845 million lb		
Decatur, Ill.		670
Morrisville, Pa.	50	
Lafayette, Ind.		
A-B Plant 2	125	
Industry total: 6,709 million lb		

P&P survey identifies some coating mill trends and supplier strategies

Exclusive P&P survey of top U.S. coated paper producers reports on coated production, use of pigments, additives, binders, new technology

By SHARLENE GRAHAM

■ Following economic setbacks in the paper industry during the early 1980s, the coated paper market has tightened considerably. Both producers of coated papers and their coating ingredient suppliers have become increasingly conscious of today's fierce competition. This was particularly evident during a recent *Pulp & Paper* survey, when most mills and suppliers would not comment on coating material makeup because they felt it was a highly proprietary subject. Therefore, this article does not examine individual mills and their particular methods of coating but rather discusses coating trends as a whole, based on input from a sampling of the nation's larger coated paper producers.

COATED GRADE PRODUCTION. Of the companies responding to the survey, the majority produced coated groundwood, closely followed by coated free sheet and coated folding boxboard. Opinions were also taken from coated specialty and carbonless paper manufacturers. The surge in coated groundwood production is due mainly to the escalating demand for Nos. 4 and 5 grades of lightweight coated (LWC) papers for periodicals, catalogs, and directories.

High postal rates have put pressure on printers to turn out lower-weight products, forcing their paper suppliers to manufacture low basis weight paper while retaining heavier basis weight qualities, such as high brightness, high gloss, and good ink holdout. Printing presses are also increasing speeds and runs, and they are using more color than ever before. Thus, paper strength has become more critical.

Although demand is up, some mills are not running

at full capacity due to the high volume of imported coated papers. API estimates that a half million tons of coated paper will be imported by the U.S. in 1985, a 68% (annualized) increase over last year. Most grades are stable, with the possible exception of coated specialties. One mill producing photographic paper, a high-cost item, used to work three shifts a day but is "barely holding one now."

PIGMENT USAGE. Mills are still using commodity pigments for coating, such as kaolin, calcium carbonate (CaCO_3) and titanium dioxide (TiO_2). Although a few mills admitted to using or testing calcined clay as a TiO_2 extender, the majority questioned doubted its ability to perform according to their specific needs. There was also little enthusiasm for plastic pigment, other than with coated specialty producers. One fact is clear—price in the end-user market usually dictates the consumption of these additives.

In a separate survey for the 1986 *Pulp & Paper Buyers Guide*, suppliers of coating pigments were asked to comment on the market for their products. Producers of kaolin clays are currently trying to re-establish the list prices of 1982, which suffered from heavy discounting during the two years that followed. One company predicts no increase in filler clays because of the "rough time" being experienced in the uncoated fine paper market today. Still another bullish company predicts overall prices to exceed the inflation rate, simply so the suppliers will recoup the inadequate returns from discounting. This company went on to say that "failure to improve prices will ultimately result in a tight supply situation in 1987 and beyond since expansion capital cannot be justified."

Titanium dioxide is expected to tighten further in the 1980s. One supplier believes the market will experience more spot shortages in specific grades, mostly attributed to low inventories. Increased demand by offshore markets will also affect availability.

As mentioned above, many paper companies are experimenting with TiO_2 extenders. Chief among these is calcined clay, which costs typically one-fourth the price of TiO_2 on a tonnage basis. However, most mills will continue to use TiO_2 at their current consumption rates since it is superior in enhancing opacity and brightness and no plastic or synthetic has yet proved to be quite as

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effective.

Calcium carbonate is beginning to compete with kaolin to some degree, particularly with the development and implementation of alkaline papermaking. Some suppliers see growth of these systems to exceed 50% of the producing market by 1990. Precipitated CaCO_3 is of premium coating quality but is fairly expensive due to a tight market. One mill predicts even tighter availability if suppliers do not expand quickly enough to meet the technological changeovers. Even so, Pfizer Inc. announced in July that it planned to "hook up" with several paper mills on the East Coast in hopes of successfully producing CaCO_3 onsite, in order to eliminate freight costs.

The situation in Europe has also been of concern to U.S. papermakers. Producers of the EEC have been quick to adapt to alkaline systems since clay is not available to them domestically and the strength of the U.S. dollar has curtailed imports. This sets up a scenario in which their abundant supply of CaCO_3 and lack of clay pushes the acceptance of alkaline papermaking, giving them the jump on the market for "longer-life" papers and at the same time improving their production costs. Even if the dollar does ease, this lower production cost (due mostly to reduced fiber requirements) may give them the edge to maintain their strong export status.

ADDITIVES, BINDERS. All mills surveyed reported concerted efforts to introduce more synthetic additives. Acetates, styrene-butadiene rubbers (SBRs), and polyvinyl alcohols are rapidly replacing starches, proteins, and other organic ingredients as the additives of choice. One mill currently producing clay-coated boxboard is aiming for a 100% synthetic coating consisting of plasticized pigments and latex instead of protein. This is being attempted "not so much for cost effectiveness, which is a factor, but for better print characteristics, such as smoothness and ink holdout." Because acetates run approximately \$0.20/lb less than SBRs, they tend to be used more often. Nevertheless, market demand for better printed gloss in web offset grades requires more synthetic usage in general.

One mill producing coated specialties is among "the very few" using acrylic as a binder. This mill maintains that it has several properties which contribute to glueability and gravure printability. Although acrylic binders are used fairly extensively in Europe, their prices in the U.S.—according to one mill—"border on the ridiculous" and remain beyond the range of most coated paper producers. As far as dispersing agents are concerned, most mills seem to use calcium stearate due to its efficiency and price.

In addition to employing more synthetics in their formulations, two mills also mentioned the use of "safe" additives, such as dyes and insolubilizers, which are formaldehyde-free.

NEW APPLIED TECHNOLOGY. Half of the mills surveyed indicated that they have recently made or will make changes in coater technology, either to accommodate higher output or simply to update old equipment.

On-machine coaters and double-coating equipment have been added to several mill production lines, many being of the "short-dwell" variety. One mill, over a four-year period, has gone completely to closed-loop controls of its off-machine coater and is making plans for an

FIGURE 1: Pigment and filler growth.

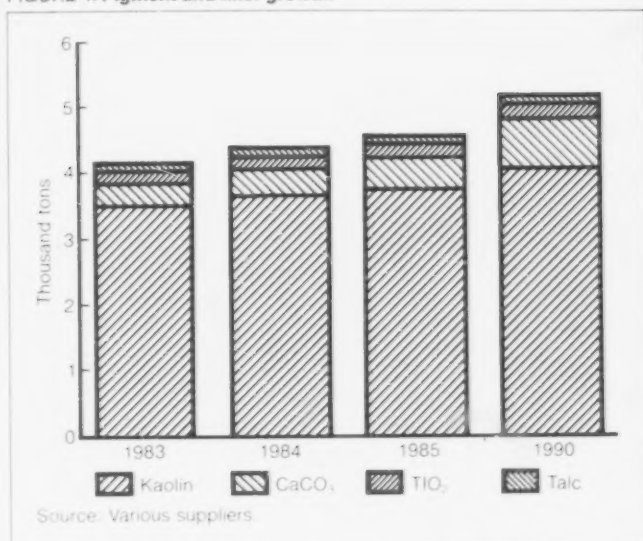


TABLE 1: Survey participants.

Coating lines surveyed	47
Clay users	100%
Titanium dioxide users	75%
Calcium carbonate users	45%
Calcined clay users	20%
Plastic pigment users	5%

automated coating kitchen in keeping with the fully automated coating concept. Expansions both large and small were noted, from incremental speed increases with little capital investment to multimillion-dollar projects involving capital equipment as well as new production lines.

One southern U.S. producer volunteered the point that developments in simultaneous two-sided coating were seen as unfeasible four years ago (that company had investigated the technology for application on LWC stock). However, now that certain European producers have successfully installed the equipment, implementation of this technology cannot be far off in the U.S.

The mill consensus regarding technology in general appears to be that "automation should be moving faster than it is." But this depends on the specific manufacturing conditions. One mill, for instance, has small coaters constantly changing short runs. It would be almost impossible to incorporate continuous coating into such an operation and very expensive to monitor the process for each run. Still, this mill is looking for more automation in the areas of solids control and other on-machine coating parameters.

Whether to allow more people to do more work or to allow fewer to do the same work was a topic raised by a mill manager concerned with the effect of coating automation on human labor. "People can argue to the contrary, but I think we have a different labor force than we had 25 years ago. Today, a job is not a worker's entire life. It's a sideline in most cases, and that is reflected in the quality of his or her work. So many times it does behoove a mill to replace workers with a machine. Coating paper is being improved by automation—I'm convinced of that."

Curriculum correction

I am writing this letter to correct errors and misconceptions in your article entitled "Today's pulp and paper schools stress high-tech specialization," which appeared in the September 1985 issue of *Pulp & Paper*.

To correct the record, the Univ. of Maine at Orono offers two programs at the Bachelor of Science level that are relevant to the paper industry—not one program as suggested in your article. The Univ. of Maine offers both the Bachelor of Science degree in chemical engineering with an option, or minor concentration, in paper engineering, and the Bachelor of Science degree in pulp and paper technology. It is the Bachelor of Science degree in pulp and paper technology that was incorrectly named and unsuccessfully described in the article.

In response to the statement "two of the pulp and paper schools surveyed . . . do not even require freshman English," I wish to point out that the Univ. of Maine requires freshman English, specifically, three credit hours of composition. In your article you used Table 1 to summarize the requirements for the undergraduate degree at institutions offering pulp and paper programs. There are several errors in the table regarding the Univ. of Maine program. Physics is not shown—the Univ. of Maine requires eight credit hours of physics, not eight credit hours of physical education as erroneously stated in the table. Also, the table neglects to indicate that Univ. of Maine students are required to take statistics (three credit hours) and computer science (two credit hours).

The second program which is relevant to pulp and paper education at the undergraduate level is the Bachelor of Science degree in chemical engineering. Unfortunately, this program was not mentioned in your article. The B.S. in chemical engineering degree is fully accredited by the Accreditation Board for Engineering and Technology (ABET) and contains a sequence of courses as a technical option or concentration. Many of the chemical engineering students at the Univ. of Maine elect to take their technical elective concentration in pulp and paper engineering. Two other technical options open to chemical engineering students are process control technology and polymer science and engineering. A technical option requires a minimum of 9 credit hours in the student's field of concentration. In the pulp and paper option, students choose from courses in wood chemistry, fiber physics, pulping technology, paper technology, two pulp and paper laboratory courses, and mathematical modeling of pulp and paper systems.

For comparison, the table below summarizes the degree requirements for both B.S. level degrees.

Joseph M. Genco
Calder Professor of
Pulp and Paper Engineering

Credits required for undergraduate degrees related to pulp and paper at the Univ. of Maine, Orono, Maine

Requirement	B.S., Pulp and Paper Technology	Chemical Engineering—Pulp and Paper option
Biology	4	0
Chemistry	23	24
Computer science	2	2
Engineering		
General	15	9
Chemical	17	36
Electrical	3	3
English	3	3
Mathematics	16	16
Physics	8	8
Pulp and paper science	18	9
Statistics	3	3
Electives (free)	3	0
Humanities/ Social science	18	18
Credits required for graduation	133	131

Nonwovens markets

Nonwovens markets and Fiber Structures Report is a new biweekly news-letter service covering developments in the worldwide nonwovens industry. Reporting on supplies and materials, costs and prices, and technology and the law, the first issue will be published Jan. 10, 1986. End use markets, including industrial, household, hospital, apparel, and others, will be covered. The news service will summarize industry activity in every important nonwovens producing and consuming country. The publication is designed for industry decision-makers, particularly those involved in corporate management, research and development, sales and marketing, production, and purchasing. Each six-page issue will contain in-depth reports, key statistics, plus analysis and interpretation of issues. Price for a one-year subscription (25 issues): \$259 (\$279 outside North America). Write: Miller Freeman Publications, 500 Howard St., San Francisco, Calif. 94105.

Paper additives survey

H&H Survey of Paper Additives is a 255-page reference guide to paper additives, process aids, and coating ingredients, designed for use by the technical, manufacturing, and purchasing departments of paper companies. It contains descriptions of 718 different products. The survey covers dry- and wet-strength resins, internal and surface sizes, saturants, retention aids, drainage aids, agents to prevent scale, pitch control agents, microbicides, defoamers, cleaning agents, felt conditioners, additives for corrosion control, agents for creping aids, filler clays and carbonates, titanium dioxides, extenders, coating adhesives and pigments, dispersants, coating additives, as well as some specialty materials. Pulping and bleaching agents are not included. Price: \$375 or \$750 for three copies, plus \$5 handling charge per copy. Write: H&H Consulting Group, 10 Tucamirgan Rd., Flemington, N.J. 08822.

Selection guide

Belt Filter Press Selection Guide provides up-to-date information on commercially available belt filter presses. It covers recent developments in belt filter presses and compares basic features. Experience of suppliers is tabulated for each application. Price: \$70. Write: McIlvaine Co., 2970 Maria Ave., Northbrook, Ill. 60062.